

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY
East Vermillion Lake, McCook County
2102-F-21-R-48
2015

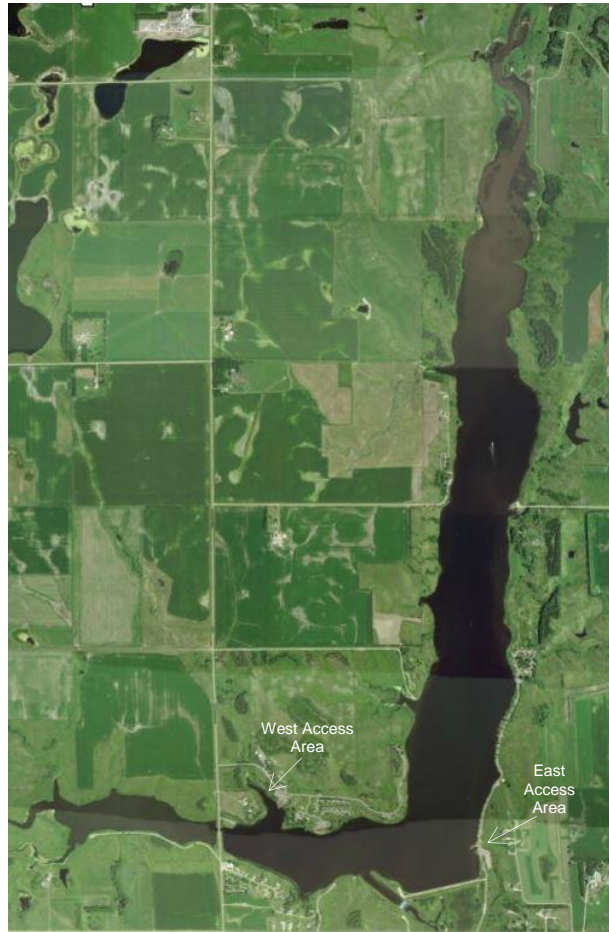


Figure 1. East Vermillion Lake, McCook County

Legal Description: T102N-R53W-Sec. 14-15, 22-23, 26-27, 33-35

Location from nearest town: 5 miles east, 1 mile south of Canistota, SD

Surface Area: 513 acres

Meandered (Y/N): No

OHWM elevation: insert

Outlet elevation: insert

Max. depth at outlet elevation: 23 feet

Observed water level: Full

Contour map available (Y/N): Yes

Watershed area: 264,789 acres

Shoreline length: 10.1 miles

Date set: insert

Date set: insert

Mean depth at outlet elevation: 12 feet

Lake volume: 6,600 acre feet

Date mapped: 1974

DENR beneficial use classifications: 4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Introduction

General

East Vermillion Lake, commonly known as Lake Vermillion, is an impoundment formed by the construction of a dam across the East Vermillion River in 1958. Battle Creek is a secondary tributary that forms the west arm of the lake. A low-level outlet gate can be opened for flood control and dam maintenance purposes. In April and July 1993, the primary and secondary spillways suffered significant damage during flood events. In March 1994, the primary spillway was undermined and collapsed due to the previous year's damage. The primary spillway was repaired by spring 1995.

Ownership of Lake and Adjacent Lakeshore Properties

East Vermillion Lake is owned and managed by the Parks and Wildlife Divisions of the South Dakota Department of Game, Fish and Parks (GFP). Together, the two divisions own 1,826 acres which includes the surface area of the lake. Public use easements grant the public the right to access and use a strip of land 50 feet wide outside the high water contour of the lake.

Fishing Access

The West Recreation Area, a fee area managed by the Parks Division, has a double lane boat ramp, boat dock, public toilet, handicapped fishing dock, modern campground, fish cleaning station, swimming beach, and shore fishing access (Figure 1). There is vehicle access to shore-fishing areas in the western arm of the lake. The East Recreation Area, also a fee area managed by the Parks Division, has a double lane boat ramp, boat dock, public toilet, campground, and shore fishing access.

Water Quality and Aquatic Vegetation

After several years of fairly good water clarity, the Secchi disk measurement in 2015 fell to 31 cm (12 in) (Table 1). Regardless, sago pondweed and native milfoil were observed during the survey. The excessive turbidity may have been caused by a recent rain event or high winds just prior to the survey.

Table 1. Water temperature, Secchi depth and observations/comments on water quality and aquatic vegetation in East Vermillion Lake, McCook County, 2006-2015.

<i>Year</i>	<i>Water Temp °C (°F)</i>	<i>Secchi Depth cm (in)</i>	<i>Observations/Comments (algae, aquatic vegetation, water quality, etc.)</i>
2015	22 (72)	31 (12)	Algae, cattails, milfoil, and sago pondweed
2014	26 (78)	155 (61)	Algae and sago pondweed
2013	-- (--)	160 (63)	Sago pondweed
2012	28 (83)	132 (52)	Sago and cattails
2011	26 (78)	191 (75)	Sago pondweed
2010	25 (77)	94 (37)	Sago and cattails
2009	24 (75)	100 (39)	Sago pondweed
2008	26 (78)	71 (28)	Sago pondweed
2007	28 (83)	61 (24)	Algae, cattails and sago pondweed
2006	26 (79)	64 (25)	Sago pondweed

Fish Community

East Lake Vermillion contains a diverse fish community consisting of many game species and only four rough fish species (Table 2). Bighead carp and silver carp, two exotic invading species, can be found in the tailrace below the spillway and pose a threat to the lake as well as the entire East Vermillion watershed.

Table 2. Fish species commonly found in East Vermillion Lake, McCook County.

<i>Game Species</i>	<i>Other Species</i>
Walleye Black Crappie Bluegill Black Bullhead Channel Catfish Yellow Perch Largemouth Bass White Crappie Northern Pike White Bass	Freshwater Drum Common Carp White Sucker Bigmouth Buffalo

Fish Management

East Vermillion Lake is relatively deep with decent water quality and only one fish kill has been documented in recent history (Table 3). Walleye, black crappie, bluegill and yellow perch are the species most sought by anglers and those that have been actively managed by stocking in the last 10 years (Table 4).

Table 3. Fish kill history for East Vermillion Lake, McCook County.

<i>Year</i>	<i>Severity</i>	<i>Comments</i>
1998	Light	August 25 kill of ~300 crappies in west arm

Table 4. Stocking history for East Vermillion Lake, McCook County, 2006-2015.

<i>Year</i>	<i>Number</i>	<i>Species</i>	<i>Size</i>
2006	51,425	Walleye	Fingerling
2009	1,661	Black Crappie	Adult
	1,187	Bluegill	Adult
2010	6,125	Black Crappie	Adult
	405	Bluegill	Adult
2011	196	Walleye	Large Fingerling
	737	Yellow Perch	Adult
2013	50,530	Walleye	Fingerling
2014	10,207	Walleye	Large Fingerling
2015	36,240	Walleye	Fingerling

Methods

East Vermillion Lake was sampled on July 6-8, 2015 with four overnight gill-net sets and 10 overnight trap-net sets. The trap nets were constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets were 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on Sept. 17, 2015 to evaluate walleye recruitment.

Results and Discussion

Net Catch Results

White sucker, walleye, white bass and freshwater drum were the most common species sampled in the gill nets, respectively (Table 5) while black bullhead, white sucker and common carp topped the trap net sample (Table 7). Black bullhead trap net CPUE more than doubled since 2014 while the abundance of all other species remained more or less unchanged (Table 9).

Table 5. Total catch from four overnight gill nets set in East Vermillion Lake, McCook County, July 6-8, 2015.

<i>Species</i>	<i>#</i>	<i>%</i>	<i>CPUE</i> ¹	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
White Sucker	34	23.1	8.5	± 1.7	9.9	100	65	--
Walleye	30	20.4	7.5	± 4.5	9.5	9	5	83
White Bass	26	17.7	6.5	± 4.1	1.3	42	27	92
Freshwater Drum	21	14.3	5.3	± 2.9	1.5	81	0	--
Channel Catfish	11	7.5	2.8	± 0.8	3.0	73	36	112
Black Bullhead	7	4.8	1.8	± 1.1	83.2	--	--	--
Northern Pike	7	4.8	1.8	± 0.8	2.0	--	--	--
Yellow Perch	5	3.4	1.3	± 1.0	5.2	--	--	--
Bluegill	3	2.0	0.8	± 0.3	0.1	--	--	--
White Crappie	2	1.4	0.5	± 0.6	0.3	--	--	--
Bigmouth Buffalo	1	0.7	0.3	± 0.3	0.0	--	--	--

*10 years (2006-2015)

¹ See Appendix A for definitions of CPUE, PSD, RSD, RSD-P and mean Wr.

Table 6. CPUE by length category for selected species sampled with gill nets in East Vermillion Lake, McCook County, July 6-8, 2015.

<i>Species</i>	<i>Substock</i>	<i>Stock</i>	<i>S-Q</i>	<i>Q-P</i>	<i>P+</i>	<i>All sizes</i>	<i>80% C.I.</i>
White Sucker	--	8.5	--	3.0	5.5	8.5	<u>+1.7</u>
Walleye	2.0	5.5	5.0	0.3	0.3	7.5	<u>+4.5</u>
White Bass	--	6.5	3.8	1.0	1.8	6.5	<u>+4.1</u>
Freshwater Drum	--	5.3	1.0	4.3	--	5.3	<u>+2.9</u>
Channel Catfish	--	2.8	0.8	1.0	1.0	2.8	<u>+0.8</u>
Black Bullhead	--	1.8	0.3	1.0	0.5	1.8	<u>+1.1</u>
Northern Pike	--	1.8	0.5	1.5	--	1.8	<u>+0.8</u>
Yellow Perch	--	1.3	--	1.3	--	1.3	<u>+1.0</u>
Bluegill	--	0.8	0.3	0.5	--	0.8	<u>+0.3</u>
White Crappie	--	0.5	0.5	--	--	0.5	<u>+0.6</u>
Bigmouth Buffalo	0.3	--	--	--	--	0.3	<u>+0.3</u>

Length categories can be found in Appendix A.

Table 7. Total catch from 10 overnight trap nets set in East Vermillion Lake, McCook County, July 6-8, 2015.

<i>Species</i>	<i>#</i>	<i>%</i>	<i>CPUE</i>	<i>80% C.I.</i>	<i>Mean CPUE*</i>	<i>PSD</i>	<i>RSD-P</i>	<i>Mean Wr</i>
Black Bullhead	501	59.1	50.1	<u>+13.1</u>	436.7	99	50	--
White sucker	117	13.8	11.7	<u>+4.7</u>	3.7	98	96	--
Common Carp	108	12.7	10.8	<u>+3.3</u>	4.6	98	67	--
White Bass	38	4.5	3.8	<u>+3.0</u>	0.5	82	58	93
Northern Pike	19	2.2	1.9	<u>+0.7</u>	1.5	89	16	83
Channel Catfish	15	1.8	1.5	<u>+1.3</u>	1.5	80	40	103
Freshwater Drum	12	1.4	1.2	<u>+0.8</u>	0.4	83	25	--
Walleye	12	1.4	1.2	<u>+0.9</u>	1.3	--	--	--
Bigmouth Buffalo	8	0.9	0.8	<u>+0.6</u>	0.1	--	--	--
Bluegill	8	0.9	0.8	<u>+0.5</u>	3.1	--	--	--
White Crappie	7	0.8	0.7	<u>+0.3</u>	0.7	--	--	--
Black Crappie	2	0.2	0.2	<u>+0.3</u>	5.2	--	--	--
Largemouth Bass	1	0.1	0.1	<u>+0.1</u>	0.0	--	--	--

*10 years (2006-2015)

Table 8. CPUE by length category for selected species sampled with trap nets in East Vermillion Lake, McCook County, July 6-8, 2015.

<i>Species</i>	<i>Substock</i>	<i>Stock</i>	<i>S-Q</i>	<i>Q-P</i>	<i>P+</i>	<i>All sizes</i>	<i>80% C.I.</i>
Black Bullhead	--	50.1	0.4	24.8	24.9	50.1	+13.1
White sucker	--	11.7	0.2	0.3	11.2	11.7	+4.7
Common Carp	0.1	10.7	0.2	3.3	7.2	10.8	+3.3
White Bass	--	3.8	0.7	0.9	2.2	3.8	+3.0
Northern Pike	--	1.9	0.2	1.4	0.3	1.9	+0.7
Channel Catfish	--	1.5	0.3	0.6	0.6	1.5	+1.3
Freshwater Drum	--	1.2	0.2	0.7	0.3	1.2	+0.8
Walleye	0.5	0.7	0.2	0.3	0.2	1.2	+0.9
Bigmouth Buffalo	--	0.8	0.7	0.1	--	0.8	+0.6
Bluegill	--	0.8	0.1	0.3	0.4	0.8	+0.5
White Crappie	0.1	0.6	0.2	0.1	0.3	0.7	+0.3
Black Crappie	--	0.2	--	0.2	--	0.2	+0.3
Largemouth Bass	--	0.1	--	--	0.1	0.1	+0.1

Length categories can be found in Appendix A.

Table 9. Gill-net (GN) and trap-net (TN) CPUE for selected fish species sampled in East Vermillion Lake, McCook County, 2006-2015.

<i>Species</i>	<i>Gear</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>
Bigmouth Buffalo	GN	--	--	--	--	--	--	--	--	--	0.3
	TN	--	--	--	--	--	--	--	--	0.5	0.8
Black Bullhead	GN	174.5	98.8	86.8	131.3	59.0	86.5	164.7	20.3	8.2	1.8
	TN	2718.8	534.1	78.9	491.4	39.5	214.4	152.4	64.0	23.6	50.1
Black Crappie	GN	0.3	--	0.3	0.3	2.0	2.0	2.3	0.3	0.3	--
	TN	1.1	0.9	0.3	0.5	11.3	35.5	0.9	0.8	0.9	0.2
Bluegill	GN	--	--	--	--	--	--	--	0.3	--	0.8
	TN	4.9	2.5	3.6	0.8	2.1	4.1	2.1	3.7	6.1	0.8
Channel Catfish	GN	10.8	2.8	3.8	5.5	0.3	0.3	2.3	0.3	1.5	2.8
	TN	3.1	3.1	2.7	0.3	0.2	0.1	1.1	1.2	1.4	1.5
Common Carp	GN	3.0	3.8	2.0	0.8	0.5	1.0	3.3	1.8	1.0	--
	TN	2.3	8.2	7.5	0.3	1.8	1.1	3.3	7.6	3.2	10.8
Freshwater Drum	GN	0.3	--	--	--	0.8	1.3	1.7	4.3	1.5	5.3
	TN	--	--	0.1	0.1	1.0	1.0	0.4	0.3	0.3	1.1
Northern Pike	GN	--	0.5	0.8	0.3	1.0	4.3	3.7	4.0	3.7	1.8
	TN	1.3	0.2	1.0	0.3	0.7	2.7	3.4	1.2	2.2	1.9
Walleye	GN	17.8	8.8	10.0	7.3	10.5	7.5	13.7	8.0	3.7	7.5
	TN	0.1	2.2	2.2	1.7	1.7	1.2	0.4	0.4	2.0	1.2
White Bass	GN	--	--	--	--	--	--	--	1.0	5.0	6.5
	TN	--	--	--	--	--	0.3	0.1	0.3	0.9	3.8
White Crappie	GN	0.3	--	--	--	2.0	--	--	--	--	0.5
	TN	--	0.2	--	0.1	0.1	4.1	1.1	0.3	0.1	0.7
White Sucker	GN	3.0	8.3	10.0	10.0	18.5	19.8	3.3	9.0	8.7	8.5
	TN	2.1	1.6	2.5	5.2	4.4	5.2	2.0	0.6	1.9	11.7
Yellow Perch	GN	6.3	7.3	11.5	2.8	4.3	12.0	1.7	3.0	1.3	1.3
	TN	1.5	0.7	0.1	0.1	1.5	1.9	--	--	0.1	--

Walleye

Management Objective

- maintain a walleye population with a total gill-net CPUE of at least 10

Management Strategy

- stock small walleye fingerlings at the rate of 70/acre (35,910) as needed

After two years of steady decline, walleye CPUE increased in 2015 (Table 10) although it remains below the management objective. The majority (93%) of walleyes sampled were age-1 and age-2 fish (Table 13). These ages line up with the stockings in 2013 and 2014 (Table 11) and the relatively low abundance of both year classes was indicated by fall electrofishing (Table 12). Compared to 2014, fewer larger walleyes were sampled (Figures 2, 3).

A moderately-strong year class of age-0 walleyes was produced in 2015. About 60% of the stocked small fingerlings were marked with oxytetracycline (OTC). Of the 50 fish collected during fall electrofishing, marks were present on 23 of 50 fish examined indicating an 89% contribution to the year class by stocking. The size and condition of age-0 fish were similar to that over the preceding 5 years. CPH of age-1 walleyes was only 8 with growth about average and condition poor.

Table 10. CPUE, PSD, RSD-P, and mean Wr for all walleyes sampled with gill nets in East Vermillion Lake, McCook County, 2006-2015. Stocked years are shaded.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CPUE	17.8	8.8	10.0	7.3	10.5	7.5	13.7	8.0	3.7	7.5
PSD	60	59	0	21	40	33	43	22	85	9
RSD-P	4	15	0	4	0	11	8	3	20	5
Mean Wr	98	86	89	94	85	84	82	89	88	83

Table 11. Walleyes stocked into East Vermillion Lake, McCook County, 2006-2015.

Year	Number	Size
2006	51,425	Fingerling
2011	196	Large Fingerling
2013	50,530	Fingerling
2014	10,207	Large Fingerling
2015	36,240	Fingerling

Table 12. Age-0 and age-1 walleyes sampled with nighttime electrofishing on East Vermillion Lake, McCook County, 2006-2015.

Year	Stocking	Age-0 CPH	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	Mean length (range; mm)	Wr
2015	fingerling	83	89	158 (139-198)	78	8	243 (211-253)	71
2014	none	1		157 (155-157)	89	7	259 (235-259)	79
2013	fingerling	154		176 (127-210)	94	0		
2012	none	0					272 (189-282)	85
2011	none	52		133 (112-164)	90	60	215 (185-256)	78
2010	none	102		172 (138-220)	81	24	¹ (238-343)	
2009	none	164		174 (135-190)	97	7	206 (205-211)	98
2008	none	35		188 (170-215)	98	2	226 (226-226)	83
2007	none	23		151 (131-151)	75	156	221 (171-262)	81
2006	fingerling	326	8	144 (116-205)	85	2	254 (212-268)	92

¹ Only the smallest and largest age-1 individuals were measured to provide a range of lengths.

Table 13. Weighted mean length at capture (mm) for walleyes sampled with gill nets in East Vermillion Lake, McCook County, 2006-2015. Note: sampling was conducted at approximately the same time during each year allowing comparisons among years to monitor growth trends. Sample size is in parentheses.

Year	Age-1	Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11
2015	228 (30)	310 (14)	--	394 (1)	--	--	--	--	646 (1)	--	--
2014	248 (22)	-- (3)	372 (2)	404 (10)	462 (4)	--	--	594 (1)	485 (1)	--	--
2013	-- (32)	304 (6)	347 (22)	466 (4)	--	--	--	--	--	--	--
2012	269 (41)	320 (17)	391 (15)	449 (3)	496 (3)	587 (2)	--	--	--	--	--
2011	196 (30)	334 (12)	397 (13)	-- (2)	466 (2)	--	--	--	--	550 (1)	--
2010	255 (39)	-- (28)	408 (3)	438 (8)	--	--	--	--	--	--	--
2009	-- (28)	291 (4)	351 (23)	555 (1)	--	--	--	--	--	--	--
2008	216 (40)	290 (2)	372 (37)	-- (1)	--	--	--	--	--	--	--
2007	270 (35)	323 (6)	387 (5)	392 (5)	461 (2)	446 (2)	468 (3)	518 (3)	552 (1)	629 (2)	478 (1)
2006	229 (71)	325 (18)	418 (19)	-- (20)	448 (5)	457 (5)	510 (3)	--	531 (1)	--	--

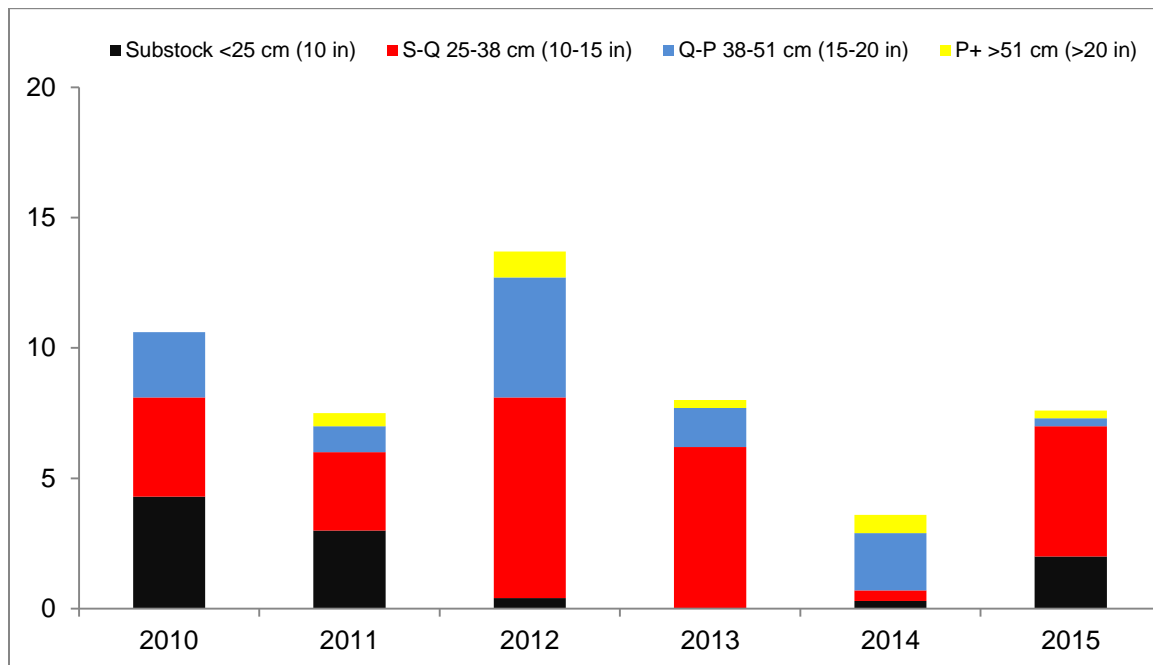


Figure 2. CPUE by length category for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2010-2015.

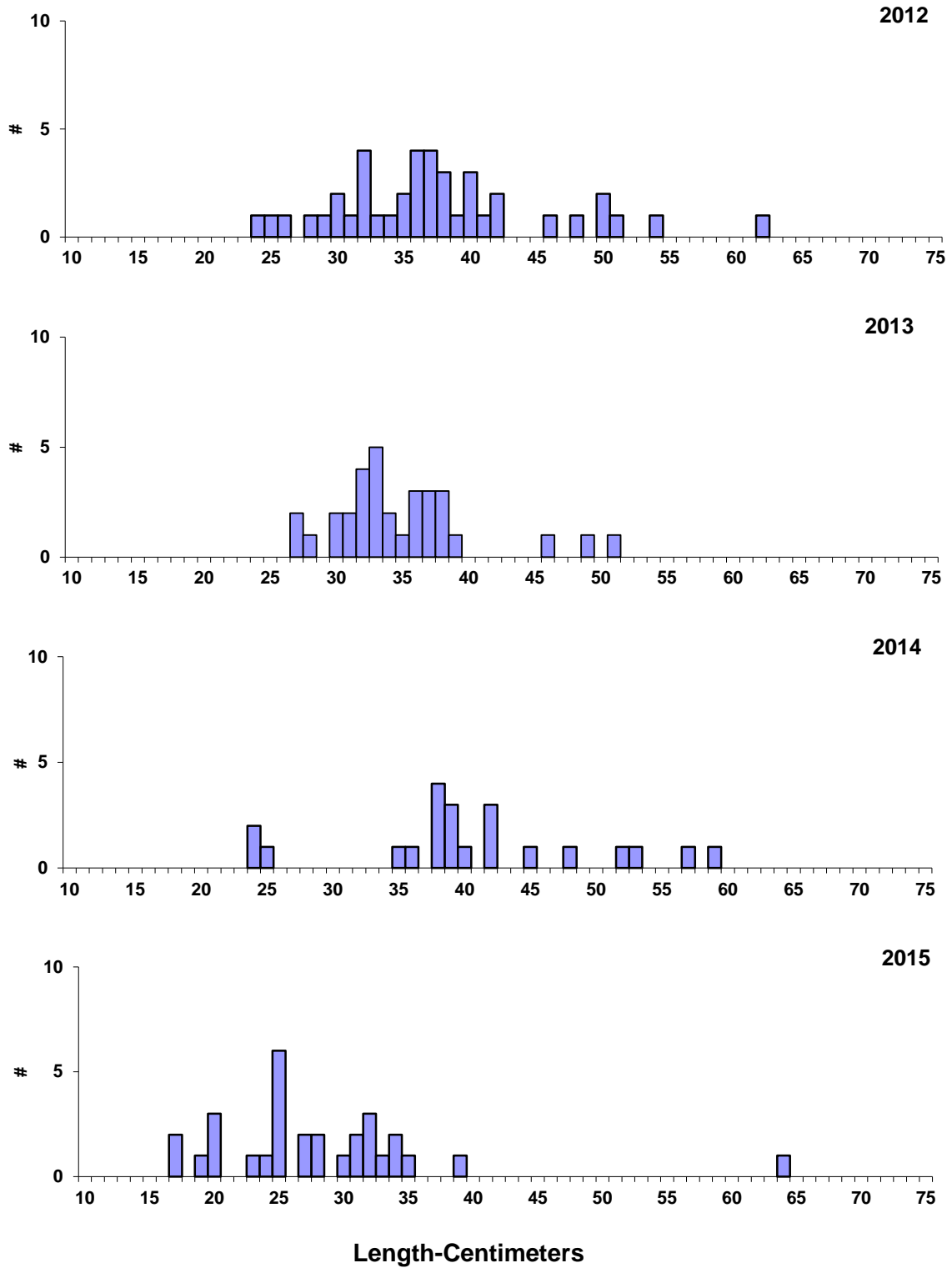


Figure 3. Length frequency histograms for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2012-2015.

Black Crappie

Management Objective

- none

Management Strategy

- monitor the population during annual lake surveys

Black crappie abundance remains very low (Table 18) because no significantly large year class has been naturally created since 2010-2011 (Figures 6, 7).

Table 14. CPUE, PSD, RSD-P, and mean Wr for all black crappie sampled with trap nets in East Vermillion Lake, McCook County, 2006-2015.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CPUE	1.1	0.9	0.3	0.5	11.3	35.5	0.9	0.8	0.9	0.2
PSD	--	--	--	--	47	41	--	--	--	--
RSD-23	--	--	--	--	5	10	--	--	--	--
RSD-P	--	--	--	--	3	5	--	--	--	--
Mean Wr	--	--	--	--	110	108	--	--	--	--

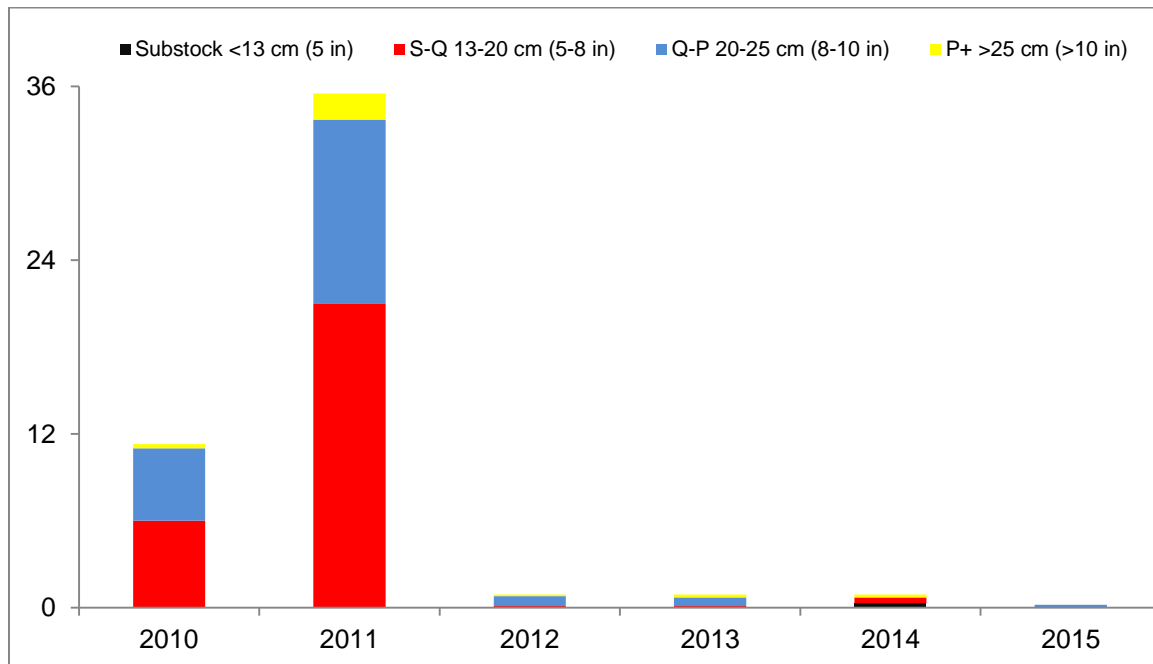


Figure 4. CPUE by length category for black crappies sampled with trap nets in East Vermillion Lake, McCook County, 2010-2015.

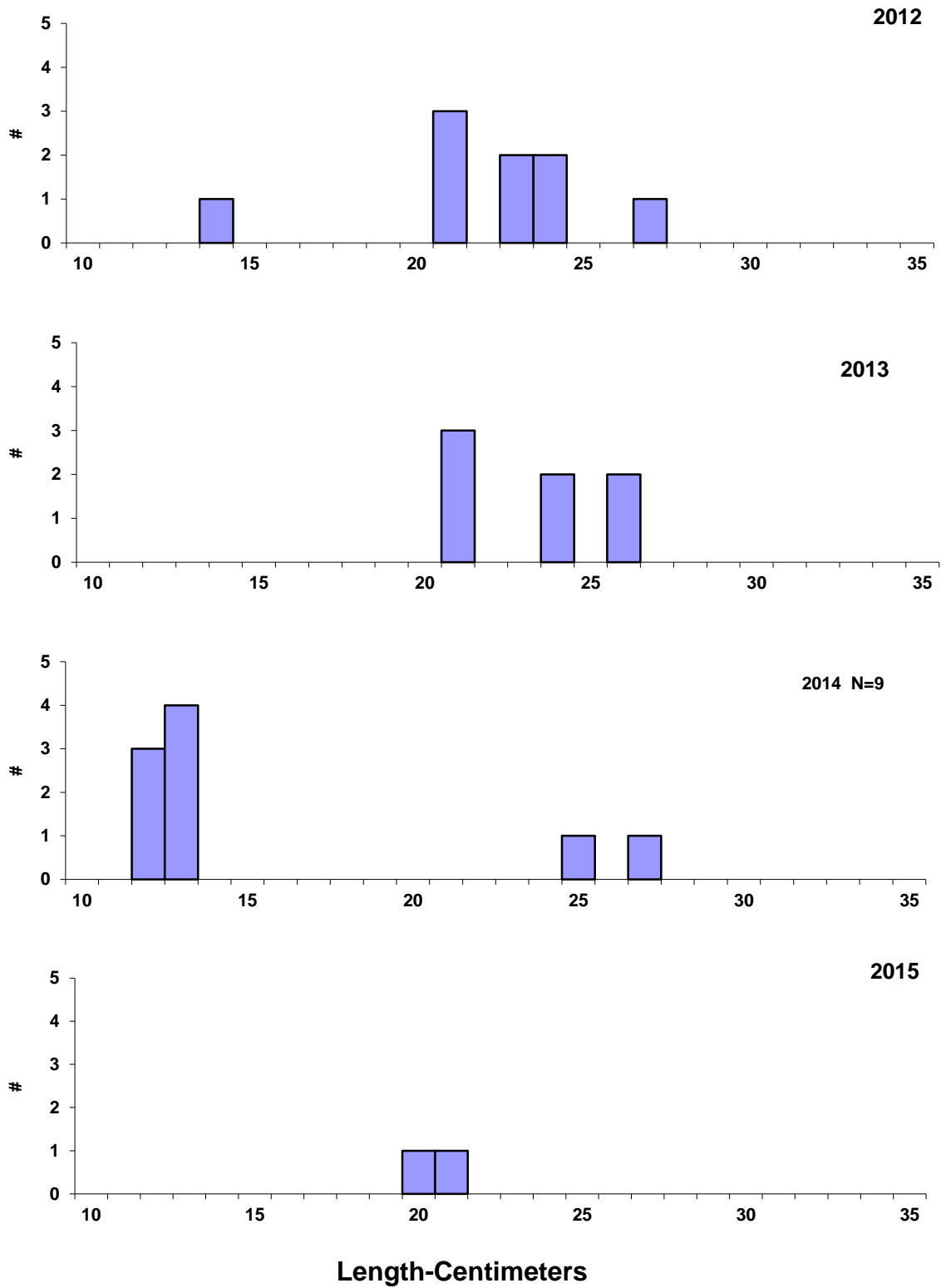


Figure 5. Length frequency histograms for black crappies sampled with trap nets in East Vermillion Lake, McCook County, 2012-2015.

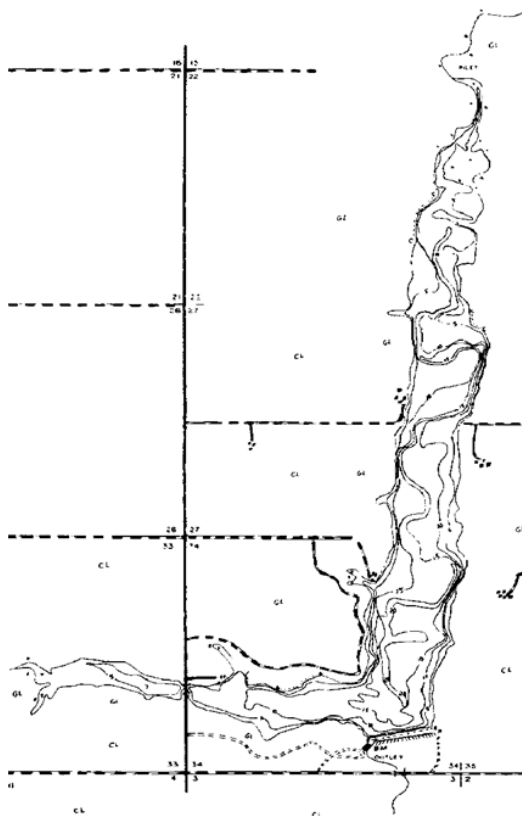


Figure 6. Contour map of East Vermillion Lake, McCook County.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters (Inches in parenthesis).

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25 (10)	38 (15)	51 (20)	63 (25)	76 (30)
Yellow perch	13 (5)	20 (8)	25 (10)	30 (12)	38 (15)
Black crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
White crappie	13 (5)	20 (8)	25(10)	30 (12)	38 (15)
Bluegill	8 (3)	15 (6)	20 (8)	25 (10)	30 (12)
Largemouth bass	20 (8)	30 (12)	38 (15)	51 (20)	63 (25)
Smallmouth bass	18 (7)	28 (11)	35(14)	43 (17)	51 (20)
Northern pike	35 (14)	53 (21)	71 (28)	86 (34)	112 (44)
Channel catfish	28 (11)	41 (16)	61 (24)	71 (28)	91 (36)
Black bullhead	15 (6)	23 (9)	30 (12)	38 (15)	46 (18)
Common carp	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)
Bigmouth buffalo	28 (11)	41 (16)	53 (21)	66 (26)	84 (33)

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.